Reaching rural: identifying implicit social networks in community development programmes

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Abstract

Exogenous, endogenous, neo-endogenous, and more recently, nexogenous development have been prominent theories of rural development in Europe over the past several decades. While these theories of rural development are well known in Europe, they are less prominent in the US. This paper explores how they might be applied in a US context, through a study of the operation and network relationships of not-for-profit, community development organisations in the U.S. state of Missouri. This paper introduces a conceptual approach to classifying rural development networks as *explicit* and *implicit* networks. Results show that pillars of neo-endogenous development, namely the importance of social networks, can be identified through an easily replicable and quantitative research design. An *implicit* network graph is realised which shows promise for acting as a conduit for social and human capital into rural areas. It is argued that implicit networks have potential to be leveraged by rural communities in pursuit of sustainable development efforts.

Introduction

The importance of civic engagement, social capital and the networks through which social reciprocity and trust is traded in prominent theories of rural development cannot be overstated. Over the last several decades, social theorists like Bourdieu (1984), Coleman (1988) and Putnam (1993, 1995) helped in bringing social capital to the forefront of social and economic research. In the mid 1990's, the World Bank adopted a policy based on the growing literature around New Institutional Economics, which recognises the importance of indigenous institutional growth vis-à-vis the creation of

social capital (Woolcock & Narayan, 2000). Indeed, social capital is a mainstay in dominant theories of rural development in Europe. Endogenous, neo-endogenous, and most recently, nexogenous development theories all acknowledge the importance of local engagement and the promotion of social capital through wider networks to some degree (Atterton, 2007; Bock, 2016; Bosworth et al., 2016; Bosworth & Atterton, 2012; Ray, 1999, 2001; Shortall, 2008; Shucksmith, 2000, 2010). Social networks are often seen as positive attributes for rural development and have potential to be scaled up to levels beyond the immediate community. Perhaps Lee *et al*. (2005) state it best in saying:

> We understand positive change to be locally embedded, socially inclusive, and, often, producing or encompassing networks that link social scales (between local, national, and international, for example). Successful development therefore frees rural areas from stereotypes of backwardness, remoteness and parochialism, and yet allows them to retain control of distinctive and valued cultural and environmental features. Fostering networks and social capital are examples of interventions in the process of development that can have long-term beneficial results. (p. 280)

This paper uses a neo-endogenous framework to conceptualise rural development in the U.S., using Missouri as a case study area. Neo-endogenous theory offers a congruent development approach that has been shaped by almost two decades empirical research and dialectic discussion by numerous authors (Atterton, 2007; Bosworth & Atterton, 2012; High & Nemes, 2007; Nemes, 2005; Ray, 1999; Shucksmith, 2000, 2010). Much of the thought and empirical research that engages neo - endogenous theory is based in Europe and uses the EU's LEADER programme as a case study. Ray, who in earlier work outlines neo-endogenous theory (*see* Ray, 2001), acknowledges that '. . . the challenge for neo-endogenous rural development is to devise a coherent theory and modus operandi for the [then] contemporary conditions of the EU.' (2006, p. 278)

In addition, neo - endogenous theory offers a fully conceptualised framework from which to study social networks that is specific to rural development, and, while its earlier days of conception focus on solving problems faced in rural development in EU

member countries, it is argued that it is a fitting approach to understanding rural development in the U.S. as well, especially as it pertains to networks analysis. In this paper, neo - endogenous theory is used to conceptualise the impact that interconnecting board networks have on rural development in rural and remote parts of Missouri. Furthermore, the paper utilises a deterministic methodological approach, characteristic of U.S. approaches to rural development research (Shucksmith & Brown, 2015), which is informed by the neo-endogenous development framework.

It is argued throughout this paper that interconnected boards form implicit social networks that carry vital information, and, that according to neo-endogenous theory, these networks have the potential promote successful rural development efforts by transferring useful social capital from urban areas into rural areas; and, lastly, that these networks, if found to exist, can be leveraged by rural organisations to access beneficial social capital.

This paper offers a fitting addition to the special issue's theme, 'Rural inequalities Amidst Economic Crisis and Change' as the obtainment of useful social capital offers a solution to the development of rural areas even in the face of challenging economic times. If the transaction costs associated with creating social capital are lower than its gross benefit, it is a worthy pursuit in developing rural areas. That is, once networks have been identified, practitioners can 'plug' their organisation into the network by forming meaningful connections with desired groups. This approach is a social capital strategy (Nanetti & Holguin, 2016) that looks to maximise the benefit of social capital by leveraging interlocking board networks.

The following sections provide a background on relevant literature, a review of case study area, the methodological approach and the results.

Theoretical Framework

This paper analyses community development organisations' (CDO) network dynamics. Neo-endogenous development provides a useful framework for conceptualising CDO network structures and has a logical approach to the conceptualisation of *extra-communal* networks in development theory. Neo - endogenous theory has a rich history of study in Europe, dating to the end of the

1990's. Its history and place within the analysis of social networks is reviewed in the following paragraphs.

Lowe et al. (1995) called for the aggregation of the then-current dominant rural development theories – exogenous and endogenous – in their work entitled, "*Networks in Rural Development: Beyond Exogenous and Endogenous Models."* They state:

> We conclude that the exogenous/endogenous distinction privileges an artificial spatial polarity and we propose an approach to the analysis of rural development that instead stresses the interplay between local and external forces in the control of development processes. (Lowe et al., p. 89)

The above passage alludes to the importance of social networks *between local and external forces.* During this time, there was a general consensus in the literature that a new approach to rural development theory was needed, one that included social networks as a bridge between endogenous and exogenous development theory (Nemes, 2005). Neo - endogenous development theory emerged in the early 2000's as one conceptual synthesis of development theory that included elements of both endogenous and exogenous development theory (High & Nemes, 2007), with Ray's (2000) work representing the first formal outline of the theory.

Ray (2001) introduced the term neo-endogenous development and recognised that, "development based on local resources and local participation can . . . be animated from three possible directions . . . *within* the local area . . . *from above* . .[and] *from the intermediate level* [sic]" (p. 8-9). It builds upon the then contemporary theories of development, termed exogenous and endogenous, by acknowledging the intricate nature, "between local areas and their wider political and other institutional, trading and natural environments" (p. 3-4).

A critical argument of neo-endogenous theory is that rural development is optimised through the utilisation of network structures reaching beyond immediate or intercommunal social and economic resources. In this sense, networks, which reach beyond community boundaries, are seen as beneficial. Bosworth et al. (2016), who looked at the networks of local partnerships in LEADER programmes, states that:

> The notion that rural development is best achieved through a combination of local resources and local action integrated within wider networks reflects the neo-endogenous development approach, which offers an alternative to dualistic 'top-down' or 'bottom-up' perspectives (p. 2).

Atterton (2007) contends that these are akin to what Granovetter (1973) famously called 'weak ties', and that they can be beneficial to entrepreneurship and economic development in rural areas. While Atterton (2007) states that her research respondents were keen to avoid what they viewed as excessive interventions aimed at creating extra communal business networks, she acknowledges that policy makers may also act as network brokers to encourage the creation of new weak ties in entrepreneurs.

This study is interested in the collective social capital of CDO's spanning both rural and urban landscapes. Atterton's (2007) findings are interesting in that the phenomena of over-embeddedness of rural entrepreneurs in the Scottish Highlands may also affect rural CDO's in the U.S. Over-embeddedness can be defined as the phenomena that occurs when a rural organisation or business's social networks become static and do not extend beyond their rural local. The notion of rural over-embeddedness is similar to homophily in the analysis of social networks in a neo - endogenous framework. Homophily is the process by which individuals or organisations in a social network become more alike over time (Mcpherson, Smith-lovin, & Cook, 2001; Newman & Dale, 2007) as they lose contact with other organisations. Homophily, like over-embeddedness, is seen as a negative attribute in terms of development as networks with high levels of homophily lack a mechanism to spread diverse information.

Though not definitive, if over-embeddedness is occurring in rural CDO's in Missouri, and restricting their collective social capital, social network analysis is a suitable way to detect this. As it has been documented that CDO's actively pursue board members with high levels of social capital, it is expected that the proportion of network size should not differ between rural and urban areas.

Network analysis offers a robust methodology and insight into the network structures of CDO's, but it is the signals transferred through networks that are pivotal to neo-endogenous development theory. Indeed, Ray (2001) warned that the creation of network structures alone does not guarantee the formation of useful social capital in development efforts, and it can difficult to discern who is benefiting from these networks (Shucksmith, 2000). Still, the necessary *social infrastructure* may exist which binds rural areas to their urban counterparts, where government and development institutions are often found. Therefore, the degree to which rural areas have explicit networks, those fostered or introduced through policy, and implicit networks, those which exist outwith of direct policy, deserves attention.

Explicit and implicit networks

Less is known about the nature of networks that exist explicitly or implicitly and act as conduits through which social capital travels. Ray (2001) argued that the EU's LEADER programme provides the opportunity for transnational connectivity guided by principals of neo-endogenous development. That is, the nature of the LEADER programme is such that it acts as a natural network, which connects rural and remote areas to one another through shared rural development policy; this network also connects rural areas to those to that are more urban, and, ultimately, to Brussels and the EU parliament. Ray suggests the use of a connectivity score in identifying the potential for the connectivity of LEADER initiatives. Ray (2001) states:

> . . . The general point is that a relatively modest number of projects creates a major potential in terms of transnational connectivity within the system. . The hypothesis is that, once started, and if sustained by some extra local coordination and funding, then the system displays a capacity for development whose scale and significance goes far beyond the sum of TCP's [trans-national projects] created. (p. 99)

Ray's (2001) argument for a connectivity score is mathematically identical to a graph or network density score, though Ray's connectivity score is presented as an integer whereas graph density is a ratio (total connections / all potential connections). In this instance, and within the context of the quote above, Ray's (2001) LEADER network theory may be thought of as being an *explicit* rural network. Since Ray's (2001) paper,

LEADER has adopted networking as a central pillar in its approach to rural development (*The LEADER Approach: A basic guide*, 2004).

The LEADER programme can be thought of as an explicit rural network because it acknowledges the importance of social networks and has included mechanisms to build and strengthen network capacity in rural areas. Explicit social networks are those that are included as a growth mechanism at a policy level, including local and regional policy to national and transnational policy. Explicit social networks are in line with neo-endogenous development theory, and can be found in the different levels of the EU's LEADER programme. Explicit rural networks result from policy that is influenced, in part, by the troves of academic literature on the importance of social capital in rural development(*see* Bignami-Van Assche, 2005; Bosworth & Atterton, 2012; Caudell, Rotolo, & Grima, 2015; Esparcia, 2014; Marquardt, Möllers, & Buchenrieder, 2012; Woolcock & Narayan, 2000).

The EU's LEADER programme offers a unique perspective on explicit rural network mechanisms and how networks can be measured qualitatively and quantitatively. Marquardt, Möllers, and Buchenrieder (2012) studied the explicit networks that are found in the LEADER programme in Romania using social network analysis. They show that both formal and informal actors are present in LEADER programme network, and that influence – measured by in-degree – is found in official LEADER administrators and private actors who do not hold a formal role.

On the contrary, implicit rural networks are networks that arise from social interaction is not necessarily stated outright in policy. Implicit networks are likely to be a crucial function of rural development in areas where networking is not directly built into rural policy as is the case in the U.S. This research explores whether or not implicit social network infrastructures exist; and, if so, are they structured in such a way that is analogous to more explicit rural networks, i.e. those that develop as part of the EU LEADER programme?

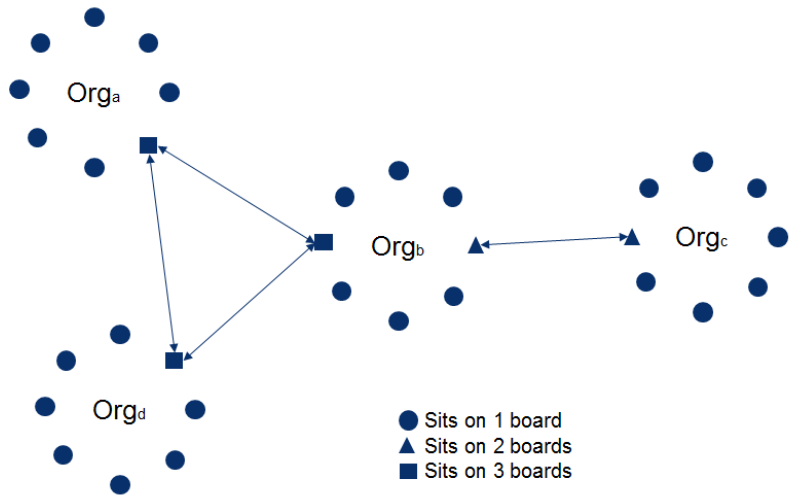
Network analysis within neo - endogenous theory

The area of research that looks at the impact that networks – specifically those which are formed when board members sit on two or more organisational boards – is known

as interlocking network research. This approach to quantifying social networks grew in popularity in the 1980's as reliable datasets became more easily attainable within the public domain. At the same time, the sociology of economics literature took notice of the importance of social embeddedness in economic transactions sparked by Granovetter's (1985) work on the subject (Mizruchi, 1996). Empirical research on interlocking networks shows that information does indeed travel between organisations vis-à-vis shared board members; though much of these studies focus on business organisations, and there is ambiguity in terms of the salient impact that different types of information has on an organisation's collective decision making (Haunschild & Beckman, 1998). More recent studies of interlocking networks have found evidence that there key actors in a network that connect powerful organisations to one another, thus creating an affiliation containing power elites (Larsen & Ellersgaard, 2017).

An interlocking board network, or graph, is undirected, meaning that individual board members act like edges that carry information between organizations in both directions. An undirected graph follows Ray's (2001) conceptual definition of neo-endogenous development. Within the context of this study, it allows for organizations operating in rural areas to transfer information to and receive information from organizations operating in urban areas, as long as a shared board member connects the organizations.

Figure 1: CDO graph attributes in neo-endogenous framework



Network analysis allows for measures of graph centrality to be calculated for each node in the graph. Called graph attributes, they deserve special attention, as attributes will have a specific contextual meaning within the neo-endogenous framework. Figure 1 illustrates a hypothetical connected graph of four CDO's, named Org_a, Org_b, Org_c and Org_d. Each point represents a board member who may either sit on one single board, two boards or three boards, as represented by a solid circle, square and triangle respectively. Org_a, Org_b and Org_d share a single board member that connects the three organizations by a geodistance of one. Org_b and Org_c share a common board member, represented by the grey triangle.

Freeman (1978) identifies the importance of two graph attributes that became popular analytical tools in the enquiry of social networks: closeness and betweenness. Closeness is a node's sum of all the shortest paths to all other nodes; more central nodes have lower closeness scores. Betweenness refers to the number of times a node acts like a bridge between two other nodes' shortest path. In Figure 1, Org_b has a betweenness score of two because it acts as a bridge connecting both Org_a to Org_c and Org_d to Org_c. Org_b also has the lowest closeness score, three, as it is connected to all other organizations by one geodistance. Org_c has the highest closeness score, five, and both Org_a and Org_d have a closeness score of four. Thus, it can be said that Org_b is the most central node in the graph.

Neo-endogenous development theory is rooted in the idea that networks that extend outwith of a rural community and into more urban areas or other rural areas are beneficial to a community's social and economic development. Ray (2001) contends that the quality of networks is just as important as the number of extemporaneous networks. This paper uses neighbourhood analysis to describe the types of ties that rural organisations have with other organisations. Neighborhood analysis identifies the nodes of *k*-degree distance from a specified set of nodes (Butts, 2008), in this case nodes that fall within a rural county. In returning to Figure 1, Org_a has both Org_d and Org_b as one-degree neighbours. That is, these two organisations are only separated by one degree. Org_c has only Org_b as a one-degree neighbour. All organisations in Figure 1 are included in each organisation's two-degree neighbourhood. Thus, it can be said that all organisations in Figure 1 are separated by only two degrees.

The formation of cliques or network nodes that are equally connected and thus share a strong bond between one another (Burt, Kilduff, & Tasselli, 2013), should be considered when looking at networks within the neo - endogenous theoretical framework. Cliques represent strong bonds that are at risk of becoming homophilic – a phenomenon that occurs when members of an isolated group become more isolated over time (Newman & Dale, 2007), if the organisation is not well connected to other organisations. That is, cliques are not necessary a negative aspect – and may be considered positive from a purely social capital approach, but, when cliques become isolated from other nodes and become over-embedded with other similar nodes, they are at risk of becoming homophilic.

Both measures of centrality and neighbourhood ties have a unique meaning as it pertains to neo-endogenous development. Community development organizations often *compete* for similar grant and revenue streams. Board members are sought after for their connections and reputation. Though not directly in competition, CDO's may target similar characteristics in board members. When looking at a state's CDO network, one logical conclusion is that geography and population will impact shared board membership. Increasing the number of board members that sit on other CDO boards will increase an organization's centrality measurements by an order of magnitude. Likewise, the types of ties that rural organisations have may be associated with the type of information that travels along these ties. These measurements will be explored in the results section, which follows an explanation of the methodological approach.

Case Study

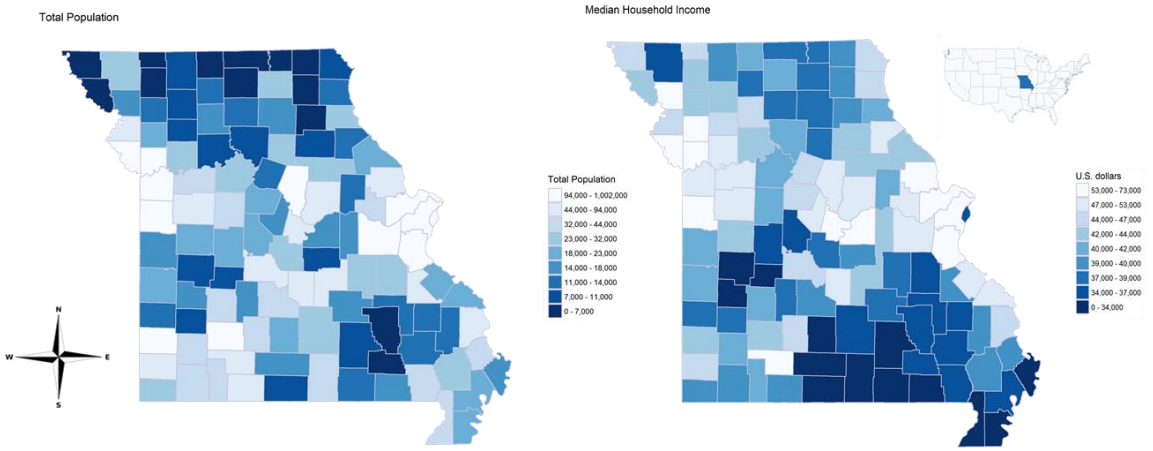
The U.S. state of Missouri is the study area. As this research is concerned with the influence of social networks and the impact that rural geography has on them, it is worth briefly discussing the state's history and geography as well as why it is a good candidate, as far as U.S. states go, for using a neo-endogenous approach.

Missouri gained statehood in 1821 and is located in the geographic centre of the U.S. Missouri is about 70,000 square miles in size (ranked 21st nationally). The state is divided into four ethnic or cultural regions; they are: The Agricultural region, which occupies the northern half of the state and continues down its western border; the

German Ethnic region, which encompasses the St. Louis city region and extends south following the Mississippi River; the Southeast region, which is similar to the Mississippi Delta; and the Ozark region, home to the Ozark mountain range (Campbell, 2004). Its population in 2013 was about 6 million, with most people living in large urban areas. Kansas City and St. Louis are the state's largest metropolitan areas with just less than 2 million and about 3 million people living in the greater metropolitan areas respectively. Both are regional financial hubs, and both fall on state borders, meaning that at least part of each city's population is not included in Missouri census data.

Figure 2 displays maps showing Missouri's 2013 population and median household income by county, on the left and right respectively. As median household income increases population increases, though only slightly. The U.S. Army Base Fort Leonard Wood is located on the southern border and has a much higher population than the surrounding areas. A consistent theme across both maps is the light colours in the north and southeast, indicating low population and income. The northern section of Missouri is characterised by rural areas with agriculture as its primary economic driver. The southeast is the Ozark region (Campbell, 2004), and comprises the state's most remote and low-income counties.

Figure 2 : Missouri Population and Median household income according to the American Community Survey 2013



The limestone bedrock serves as an indirect economic catalyst in the Ozarks (Gillman & Duley, 2013). The eroded limestone results in mountainous regions with high bluffs, hiking routes, fast flowing rivers and streams, many of which contain fisheries and are regularly stocked. This unique landscape draws money from tourists annually. According to the Missouri Division of Tourism (Archieve.org), the region reported just fewer than two billion dollars in 2015 in tourism revenue.

Like the EU's LEADER programme – though on a much smaller scale – Missouri has a rich history of institutionalised rural community development efforts, mainly through the University of Missouri's Extension programme. The Community Development Society was formed in Columbia, Missouri, home of the University of Missouri's flagship campus, in 1969 (Phifer, 1990), and still continues strong. University of Missouri extension actively works in rural community development with *ad hoc* development programmes like the Community Economic and Entrepreneurial Development (ExCEED) programme and community development field faculty working in rural areas.

Defining rural

In the U.S., like many countries around the world, there is ambiguity in how rural is defined and measured (Cromartie & Bucholtz, 2008). For the purposes of this research, rural is defined and measured on a rural-urban continuum that is designated by the United States Department of Agriculture (USDA). The USDA assigns each county in the U.S. a rural-urban classification. There are nine classifications, ranging from 1 "Metro of 1 million people and above" to 9 "Rural, less than 2,500 people not adjacent to an urban county". U.S. counties act as boundaries for local governments in much the same way Local Authorities do in U.K. They range in land area from over 50,000 square kilometres to right at 150 square kilometres. The largest county population is about 10 million, while the smallest is less than 100 people. Missouri's USDA classifications are shown spatially in the base map in Figures 4a and 4b. Missouri has a high number of rural counties in the south and southeast corner as well as the north. There is a cluster of four counties in the southeast that have less than 2,500 people per county. These counties are classified as frontier and remote areas

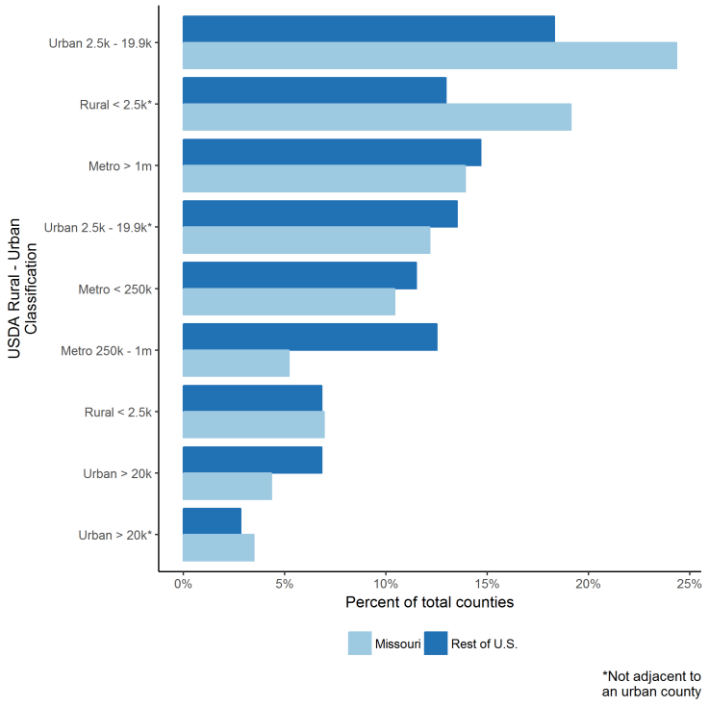
by the USDA, indicating that they have a combination of low population and geographic remoteness that is not found in other counties[1].

Comparing Missouri and the rest of the U.S.

The case study area used to gather data on CDO network boards consist of the entire state of Missouri, and, as this paper is interested the in evidencing explicit and implicit networks in general, is it necessary to adequately compare Missouri to the rest of the U.S. That is, it may be that Missouri is a special case within the greater U.S. and that selection bias may be present. In order to preserve transparency, this following section briefly reviews how Missouri sits within the greater U.S. in terms of rural counties.

Figure 3 shows the percentage of counties in the U.S. and Missouri as categorised by the USDA Rural - Urban Classification mentioned above. Figure 3 allows direct comparisons to be made between the U.S. (excluding Missouri) and Missouri in terms of proportion of counties and their categorisation. The groups are ordered by the average proportion of both groups.

Figure 3: Missouri and the U.S. rural – urban classification comparison



[1] For more information on the USDA Rural-Urban Continuum Codes, please see https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/.

We can see in Figure 3 that Missouri has the same general distribution of categories as the U.S. Though Missouri is much closer to the U.S. in proportion of rural areas that are less than twenty-five hundred and is most different from the rest of the U.S. in the proportion of Metro areas sized between 250 thousand and one million people. There are, in fact, three classifications that Missouri and the rest of the U.S. are almost exactly proportional: Rural less than twenty-five hundred, with a difference of 0.13%; Urban more than twenty-thousand not adjacent to an urban county, with a difference of 0.65%; and, Metro with over one million, with a difference of 0.77%.

Missouri has a higher proportion of counties that are classified as Rural less than twenty-five hundred that are not adjacent to an urban county, meaning these counties can only be adjacent to other rural counties, thus making them more remote. This suggests that Missouri has a higher proportion (about 6 percentage points) of rural counties that are more remote than the rest of the U.S.; Missouri ranks 7th out of 50 states in the proportion of counties that are classified as less than twenty-five hundred, not adjacent to an urban county[2].

Missouri has qualities that make it favourable for a study interested in social networks linking rural and urban areas – as Missouri has both metro and rural and remote counties that fall within a relatively compact spatial area. While it is difficult to argue that Missouri is an ideal representation of the U.S., to do so beyond the scope of this paper, Missouri's county–level rural-urban classification is quite similar to the that of the greater U.S. Though, Missouri does have a higher proportion of counties that are classified as rural and remote. This difference is perhaps favourable as it pertains to this study. It allows for the possibility of identifying the propensity for CDO network structures to permeate into rural and remote areas. In this sense, Missouri serves as a case study to observe implicit develop networks that may exist in a way that is analogous to the explicit networks found institutions like the EU's LEADER programme.

Therefore, it is argued that implicit networks, those which exist independent of and without direct policy initiatives, offer an alternative to explicit networks, those networks which are created in response to policy. Formally, this is stated as the following

[2] For a more in depth look at the difference and similarities see Appendix A.

research question: Do implicit networks exist on the same scale as explicit networks. The EU LEADER programme is an example of explicit networks and their successful inclusion in programme policy; and, Missouri is used in this study to test whether or not implicit networks exist and permeate into rural areas. Furthermore, this study will investigate the extent that this (implicit) network structure permeates into rural areas; and the extent to which organisations in rural areas form cliques, representing over-embeddedness or a risk of homophily as sometimes happens in rural areas with an explicit network structure.

Methodology

The unit of measurement is a community development organisation that has a headquarter office in Missouri. Community development organisations and charities in the U.S. must register for 501(c) (3) status in order to be tax-exempt.[3] These organisations are sometimes referred to as non-profit or not-for-profit organisations. Oversight of the organisation is left to board members, who may be community members, business persons, or those who are otherwise seen as valuable to the organisation's goal. In most instances, boards do not receive a paid salary, and membership is on volunteer bases, though this is not always true. Many large organisations may pay board presidents.

Community development organisations often rely on the influence and *connectedness* of their board members to lower the cost of transacting. The formal and informal relationships of board members are often critical to the general operation of organisations. Indeed, non-profit organisation's donations are influenced by their collective reputation, and reputable board members are sought outright (Grant & Potoski, 2015). Organisations will often maximise their board size in an attempt optimise the organisation's overall contact with influential people and powerful institutions (Oster, 1995). Executive board members are often sought out specifically for their high levels of social capital (King, 2004).

[3] 501(c)(3) Organisations are commonly referred to as charitable organisations that are exempt from paying taxes. The organisation is restricted from lobbying activities or attempting to influence legislation(Internal Revenue Service, see https://www.irs.gov/charities-non-profits/charitable-organizations/exemption-requirements-section-501-c-3-organizations)

Community development organisations are good candidates for inclusion in sociocentric network analysis. This is due, primarily, to the nature of CDOs' board structures – board members with high social capital and good reputations are often highly sought after (Oster, 1995). Therefore, a closed sociocentric network of CDO's is produced by creating an adjacency matrix from a roster of the names *all* CDO board members in Missouri.

Data come, indirectly, from the Internal Revenue Service's (IRS) archival data on 501(c)(3) organizations. Non-profit organizations that file under the status of 501(c)(3) must complete a federal 990 form, which collects financial and social information on the organization. These data are collected through the data management firm Guidestar®. The IRS requires the names, position and salary (if applicable) of all 501 (c) (3) board members be included on tax forms each year. Table 1 lists the pertinent variables obtained from Guidestar® and any changes that occurred during the cleaning process.

In addition to the variables above, data on the socioeconomic indicators were merged into the database. Using *R*'s igraph package (Csardi & Nepusz, 2006), an adjacency matrix was created from board member names that *ties* organizations that have at least one common board member. Attributed data was calculated for each organization and merged back onto the original dataset, creating a data frame with organizational details, socioeconomic details and network attributes.

Descriptive statistics, network visualizations, network mapping and modelling are presented in the following sections.

Results and analysis

In total, just over 500 different organisations were identified using the search strings "community" AND "development" in Guidestar®'s NTEE search query. The mean board size is about 10, with a large variance – some boards recorded no board members and one recorded as many as 30 different board members. As previously mentioned there are no changes to board members' names other than capitalizing and removing all formats and characters. This approach ensures that results can be easily replicated, but it also allows for some 'bridging' board members to be excluded. For instance, the names "Elizabeth A. McDonald" and "Elizabeh A. McDonald" would not

be identified as matches. It is likely that the latter name is misspelt – *the 't' is missing* – when the documents were being inputted into electronic form either at the organizational level, the IRS or Guidestar®. Likewise, these two names could represent two separate people, so there is no attempt to alter spelling.

Table 1: Data obtained from Guidestar®

Variable	Explanation
Name	Board member name; all formatting characters removed (e.g. '.','-','&', and capitalized
Org name	Organization name; capitalized
Address	Organization address, included 5-digit zip code
Tax year	Year data is recorded – 2013 for all
Formation year	Year the organization formed
Government grants	Amount received from government grants in U.S. dollars
Service revenue	Amount received from services provided in U.S. dollars
Total revenue	Total revenue in U.S. dollars
Purpose	Organization mission statement
Website	Organization website

About 42% of all organisations have at least one tie to another organisation. Table 2 shows the distribution of total organisations, the percentage of organisations with at least one tie (degree) to another organisation, the average degree and clique size per organisation within each USDA Rural-Urban classification. As seen in Table 2, metro and urban areas are home to the largest number of organisations. There are nineteen organisations that are classified as being in rural counties. The proportion of rural organisations with at least one tie is lower than metro and urban organisations, rural

organisations also have low average degrees when compared to their metro and urban counterparts.

Table 2: Network characteristics

Rural-Urban Classification	Total organisations	Proportion with at least one tie	Average degree	Average clique size
Metro > 1m	283	40.60%	0.9	0.57
Metro 250k - 1m	26	34.60%	0.8	0.54
Metro < 250k	83	45.80%	1	0.63
Urban > 20k	20	55%	0.9	0.65
Urban > 20k*	10	40%	0.6	0.4
Urban 2.5k - 19.9k	37	48.60%	1.7	0.81
Urban 2.5k - 19.9k*	21	42.90%	1.2	0.67
Rural < 2.5k	5	40%	0.8	0.4
Rural < 2.5k*	14	50%	0.6	0.57

The average number of cliques per group, shown in the last column of Table 2, is obtained by:

1. Determining whether each organisation is part of clique;
2. if an organisation is part of a clique (or several cliques), determine the size of the largest clique of which they are a member of; and, finally,
3. taking the average of each classification's largest clique.

Results from the clique analysis indicate that rural places have, on average, smaller sized cliques (0.48) than both urban areas (0.62) and metro areas (0.58). There is little difference in the percentage of organisations within at least one clique – 45% of organisations in rural areas are members of clique, 46% of urban and 41% of metro.

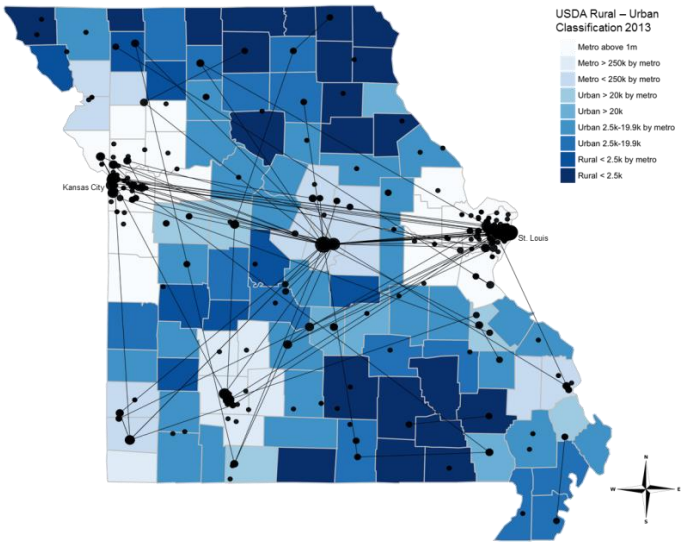
Thus, while it appears that the percentage of cliques in rural and urban areas is about the same, there is a substantial difference in the size of cliques: rural organisations have smaller cliques than their more urban counterparts. Smaller cliques are at higher risk of become homophilic or over-embedded.

Figures 4a and 4b show the resulting network plotted over a county map of the state of Missouri. Each point on the map represents a node or community development organisation, and point coordinates were obtained by merging an organisation's address with its corresponding longitude and latitude. Each node is sized according to its degree – or the total number of network ties. The lines connecting each point represent a tie, indicating that the two points are connected through a shared board member. The counties on the underlying map are coloured according to their USDA Rural-Urban Continuum Code. The darker shaded counties are more rural and remote.

As shown in Figure 4a, the majority of community development organisations which are connected by one or two degrees to one another have their headquarters in metropolitan or urban areas. The bulk of organisations have their headquarters in Kansas City or St Louis, on the west and east state borders respectively. Those organisations with headquarters in St Louis appear to have higher degree connections than Kansas City, though these connections do not appear to reach into the most rural counties on the scale that organisations in Kansas City do. Large nodes – representing well-connected boards – can be found in the centre of the state, where the state capital city, Jefferson City, is. Likewise, a metropolitan county in the southwest part of the state shows up as having a large number of organisations with ties to the larger network.

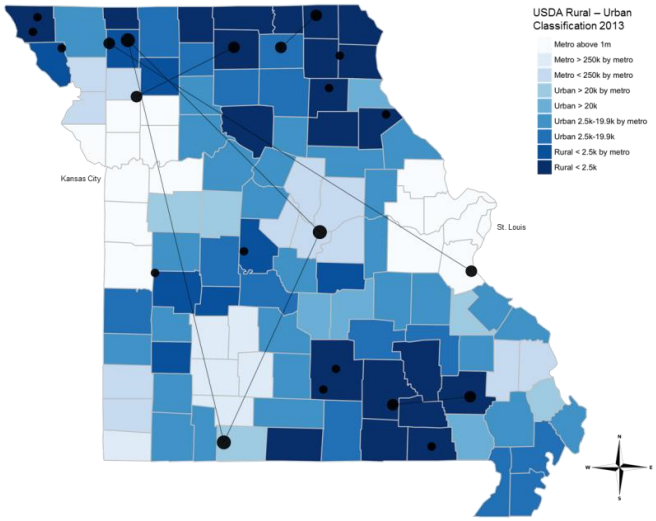
The headquarters of community development organisations that are found in rural areas appear to have connections that are likely to go to other rural areas – not directly to metropolitan or urban counties. This is clearly shown in Figure 4b, which only includes nodes found rural counties and their first-degree neighbours. There is only one organisation out of nineteen (just over 5%) with a headquarters in a rural county that also sits on the board of an organisation with a headquarters in a metropolitan county.

Figure 4a Entire network mapped according to headquarter location



Counties are coloured according to their USDA Rural-Urban Classification 2013

Figure 4b: Rural network mapped according to headquarter location



Counties are coloured according to their USDA Rural-Urban Classification 2013

The isolation of rural organisations is further illustrated in Figure 5 and Figure 6. Figure 5 shows the entire community development organisation network in Missouri. Nodes are coloured according to the same USDA Rural-Urban scale as shown in Figures 4a and 4b. Figure 5 shows one large cluster of organisations that are all connected and few isolated clusters of organisations. Beyond these isolated clusters, the majority or the graph, do not have any shared board members and are outwith of the interlocking network completely. There are two rural organisations within the large cluster of organisations that are all connected, both of which are on the periphery of the graph. This indicates their overall embeddedness is low compared to other organisations.

Figure 5: Community Organisation Network

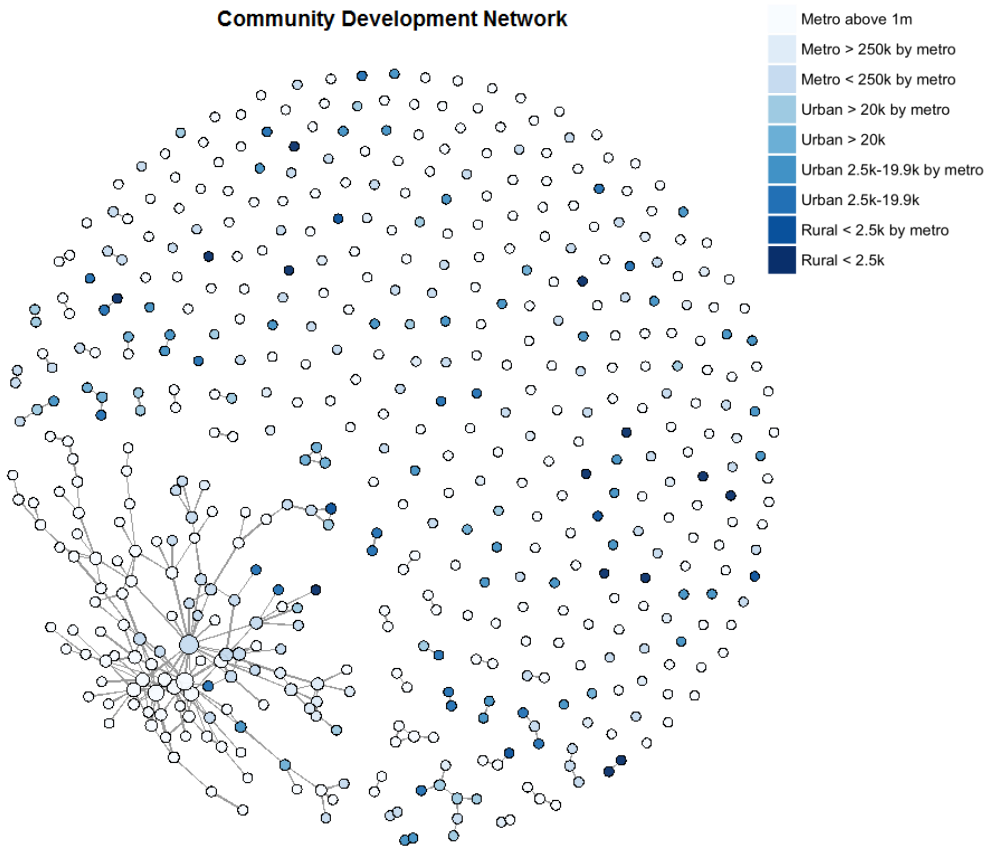


Figure 6 breaks down the neighbourhood of organisation with a rural-based headquarter. Each facet within Figure 6 represents an increased network neighbour of one degree. Each of the five spheres in Figure 6 illustrates the progressive neighbourhood growth community development organisations with headquarters based in rural counties. The neighbourhood degree of separation is labelled in the subtitles above each graph. The zero degree neighbourhoods show how isolated rural organisations are from one another. Only two rural organisations share a board

member. The one-degree neighbourhood shows the formation of a clique comprised of a rural organisation and two urban-based organisations. This clique is bridged by two metro-based organisations before reaching the main cluster of organisations. There is similar metropolitan bridge that connects a single other rural-based organisation to the main cluster. In both cases, rural organisations are separated by four degrees from the most central organisation. Furthermore, as seen in the fifth sphere, both rural organisations that are connected to the main graph are on the fringe of the network and are separated by nine degrees.

This further indicates that rural organisations are not well connected to their more urban and metropolitan counterparts.

Figure 6: Rural Neighbourhood Growth

Discussion

This study provides empirical and robust evidence on the nature of social network infrastructures in CDO's in Missouri. Neo-endogenous development theory is used as

a conceptual framework from which to make inferences on the importance of network infrastructures. As previously mentioned, it aims to 1) Determine if implicit network structures are a fundamental characteristic of interlocking community development boards; and, 2) Determine the extent that this network structure permeates into rural areas. The following paragraphs discuss the results and reviews evidence within the neo-endogenous framework.

Results indicate a large and complex cluster of CDO's form a network based on the sharing of board members. Just about forty percent of all CDO boards are inherently connected. This provides evidence that an implicit structure exists - perhaps unbeknownst to board members – that is suitable for transferring vital information between urban and rural areas. However, rural organisations are not well embedded in the network and tend to sit on the periphery of the graph. It is on the periphery where rural organisations tend to be connected in cliques' with other rural organisations. No rural organisation has more than two board members sitting on another community development board. In addition, the two rural organisations that connected to the large cluster graph (shown in Figure 5) are not connected to very highly influential nodes within the graph. That is, rural organisations are connected to other isolated organisations within the graph. This suggests that rural organisations are at risk of becoming homophilic, which will limit their organisational social capital.

Organisational geography appears to add a structural barrier for rural organisations. For instance, organisations with headquarters in Kansas City tend to connect to other organisations in the vicinity, but they do not form tight clusters. They appear to form long chains or isolated branches, which spring out from the centre of the graph. Organisations with headquarters in Kansas City are more likely to be connected with rural or less dense organisations than those headquartered out of St Louis.

This suggests that implicit networks exist for community development organisations as is evidenced by the large cluster of connected organisations. However, rural organisations do not have a strong presence in the network. This apparent lack of connections for rural organisations offers an area of potential strategic growth. In a similar vein to what Nanetti & Holguin (2016) term the 'social capital strategy', rural organisations can build and leverage social capital strategically by building social capital with organisations that complement their goals.

A question that naturally arises is why is there a lack of networks that stem between more urban and rural areas? Results indicate that some networks span hundreds of miles, connecting opposite sides of Missouri together; and these long networks are not exclusively found between major cities (i.e. links between Kansas City and St. Louis). Rather, as shown in Figure 4a, urban areas across Missouri are, on average, between one and two degrees from the major cities. If one looks closey at Figure 4b, they will notice that remote counties in the northern portion of the state have CDO's that reach, and form cliques, with urban areas across the state; they will also notice that rural counties in the sourthern part of the state have no links that reach into more urban areas.

Figure 4b provides a possible explanation: the cluster of rural and remote regions shown in the map fall into different cultural regions as defined by Campbell (2004). The northern region is comprised of the agricultural region and the southeastern region is the Ozark region. While the two regions have similar populations, the counties in the sourtheastern corner of Missouri (which falls in the Ozark cultural region), have a much lower median-household income, Household income may impact one's propensity to engage in strcitly volunteer work, as are most not-for-profit board positions. This, coupled with a low populations and a remote geography, may account for the absence of social links between this part of Missori and the rest of the state. However, more research into the nature of interconnecting board networks in rural areas is need before definitive conclusions can be drawn.

Conclusion

A limitation of this study is that it does not attempt any comparative analysis of the organisation's financial attributes. Thus, no conclusion can be drawn on the impact that implicit network inclusion has on the community development organisations included in the study. Future research on implicit network structures in rural development might include a component of comparative analysis

Social networks are a critical component of neo-endogenous development theory. This study provides a unique approach to understanding the structure of development organisation networks in an empirical and replicable way. This approach can be useful to identify the intricate nature that networks have throughout the development process. However, a more qualitative approach is needed to understand the complete picture.

While social capital is seen as a highly valued component of many development projects (Meador et al., 2016), they should view somewhat cautiously (Shortall, 2008) as they do not guarantee inclusiveness in rural areas. A more holistic and targeted approach to network development is needed to ensure that all members of rural communities can benefit from them and not only the local elite (Shucksmith, 2010). It seems likely that network structures will continue to be an important component of development theory going forward as theoretical developments are pushing towards the identification of leadership type (Meador & Skerratt, 2017) and exploring ideas of nexogenous development (Bock, 2016).

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APPENDIX A